Steam Car Developments and Steam Aviation

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Progress Report on the Leslie Steam Car.

Those of our readers who have been following the Magazine since the October, 1937, issue have doubtless wondered what progress Mr. Leslie has been making with his car. Although nothing has appeared in print, testing and design work has gone on constantly, with results that make it very fitting that this announcement should now appear exclusively in " Steam Car Developments."

For the benefit of those who are new readers of the Magazine, this car is a rather radical departure from previous steam cars. The work on the car was done in the shop of

Fig. 1.—THE LESLIE CAR.
Standing—Left to Right: I. H. Leslie, Rod Webster, G. Stevenson.

American Steam Automobile Company in West Newton, Mass. By handling in this manner, Mr. Leslie received not only the benefit of workmen skilled in building steam cars, but also valuable design advice from both Mr. Thomas Derr, president, and Mr. George A. Crosby, chief engineer.

The chassis of the car is a standard Oldsmobile 8, 1936 model. Engine is a six-cylinder, single-acting, with poppet valves and with supplementary exhaust ports, making it of the semi-uniflow type. Cylinders are cast in pairs as shown in illustration. The engine is an in-line engine, valves operated by hydraulic valve lifters. It has standard gas engine vibration damper, standard gas car connecting rods, and in general overall

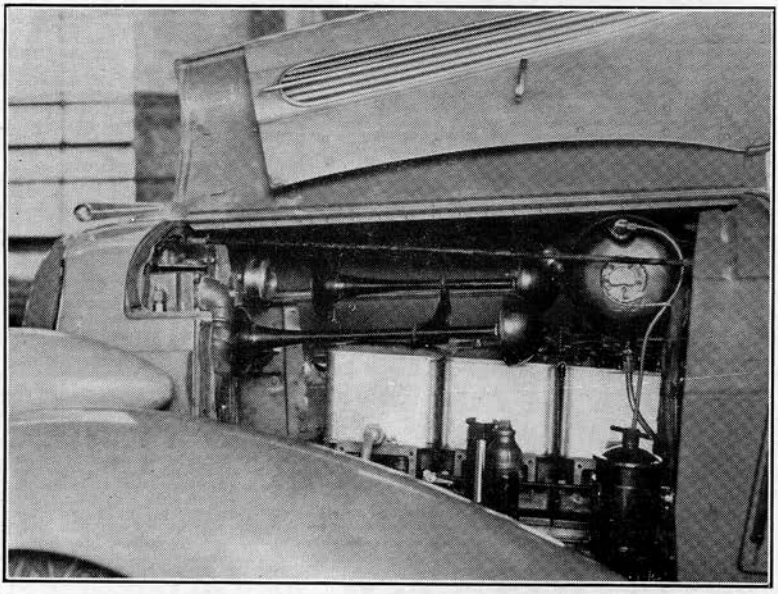

Fig. 2.—THE 6-CYLINDER S.A. ENGINE OF THE LESLIE CAR.

appearance follows gas car engine design practice to a marked degree. There is a very definite reason for this, not alone the adaptability of the engine to low cost standard rods, piston rings, etc., but many millions of dollars have been spent building this type of engine in U.S., and it was felt much could be borrowed from gas car engine design to advantage.

One of the chief disadvantages of this type of engine in the past has been the difficulty of keeping water out of crank-

case. This has been handled in the Leslie Engine by building a jacketed crankcase, through which all steam as it comes from the cylinders exhausts before going to the condenser. Thus any steam which slips by the piston rings and has a tendency to condense in crankcase is immediately vaporized when it hits the crankcase wall, and passes off as vapour. In this way there is no interference with engine lubrication.

The engine is exceedingly smooth and quiet, very powerful, and for the past two years has been giving an excellent account of itself.

Fig 3.—REAR VIEW OF THE LESLIE CAR, SHOWING THE NEW BOILER.

While the original flash boiler had many advantages, it was believed improvements could be made. With this in mind, about a year-and-a-half has been spent designing and building a still newer boiler, which for steam car practice is indeed of revolutionary design. It is a coil boiler. The coils are so arranged that the flue gases follow a very circuitous route before they are finally exhausted. The last stage of flue gas travel is over finned tubing, all of which makes for high efficiency, just as high, in fact, as that of the old Stanley fire tube boiler, which steam car men will recall was a very efficient boiler.

Unlike other coil boilers, however, this new boiler is of continuous forced circulation type. The tubes are always full of water. This should make it one of the most durable boilers ever built. In the illustration of boiler as installed in a car our readers will note that just to the left, but adjacent to boiler, is a vertical drum. This is part of the boiler. It is the steam separating drum. This drum has a water level regulator, and water level is maintained at approximately midway of the drum by the boiler feed water pump.

The operation is roughly as follows:—The circulating pump pulls water from bottom of drum, forces it through the boiler coils. This forced circulation or scraping action of the water on the boiler tubes means that a given area of tubing will do very considerably more work than under ordinary circumstances. Result, efficiency, compactness and light weight. The water being forced through tubes spills out over into steam separating drum. As it does this a certain percentage of the water bursts into steam, balance dropping immediately to the bottom of the drum to be re-circulated through the coils.

In this construction lies the advantages of coil boilers without their disadvantages. Light weight, easy economical construction, and quick steaming (the Leslie boiler steams in two minutes from cold). At the same time, this boiler possesses the advantages of the water level type, namely, equal efficiency, good reserve capacity and steam of an exceedingly uniform quality. Regardless of varying loads put on car, steam of uniform pressure and within a temperature range of 725 degrees to 750 degrees F., is delivered. Best of all, these results are secured with two very simple well-proven controls, and without the rather delicate flow meters, solenoids, quartz rods, and other complicated apparatus which has been thought to be the disadvantage of previous coil boilers. Just two controls, pressure control and water level regulator, exactly as used on any water level boiler, are used.

The burner, mounted on top of boiler and firing down, with fire impinging on fire brick at bottom of boiler, is the standard American Steam Car Burner, which has proved itself quiet, dependable and efficient. A 12-volt electrical system is employed.

At present a standard steam pump is used for supplying water from tanks to the boiler.

Condenser system is a standard radiator, with fan driven from front end of engine crankshaft, exactly as in gas car practice.

WHAT OF THE FUTURE?

While the performance of this car is indeed a revelation to those of us accustomed to present steam cars in use, and while

Fig. 4.—THE COILS OF THE LESLIE BOILER BEFORE ASSEMBLY. Although it does not show in the picture, the coil on the extreme left is made of finned tubing.

quietness, acceleration, smoothness and hill climbing ability are in distinct advance of our best petrol cars, the designers are continuing with the testing and refinement of the car. There is no necessity to get something on the market in a hurry, and nothing guides the designers at present but the desire to perfect every detail of the car. With this in mind, work is progressing along the following lines.

The steam pump is to be replaced with an engine driven pump. The engine driven pump will be much more economical of steam. It will be ever so much more compact, absolutely quiet, and very much lighter in weight.

The engine will doubtless be replaced with one of the new four-cylinder V type engines now being tested by American Steam Automobile Company. This latter engine will have the same number of cubic inches of displacement, that is, will be of the same horse-power as the six. But it will be lighter in weight, much more economical to build and, very important, it will be shorter and more compact, allowing for a neater arrangement of auxiliaries and condenser under the hood.

The boiler will probably not be changed in any way, its performance being 100 per cent. to date. In the words of Mr. Crosby, who has had 19 years of continuous experience in designing and building steam cars, " This is the first boiler we have built in which we overshot the mark and built a boiler that not only produced more steam than we needed, but also produced more steam than our theoretical calculations called for."

The change in the burner will be to attempt a variable load fire. This is not believed to be entirely original in steam car practice, as one car at least is said to have such a fire. It is believed that a variable fire, rather than the present intermittent one, will improve the efficiency of fuel consumption. It should also make the temperature of steam from the superheater still more uniform.

The condensing system is to undergo some further tests, and no doubt beneficial changes will result.

As to production plans, there are none whatever at present. The sponsor and designers of this car have set as their goal only the perfection of the car as it now stands. This requires time and patience, but the work so far indicates that the major problems have been rather well solved, and from now on rather minor problems seem to be about all that need to be worked out.

Out of the work on the Leslie Car have come some of the ideas incorporated in the new four-cylinder V engine. More important still has come the boiler. It is doubtless fair to say that out of the American Steam Automobile shop will soon come many additional benefits of the results of experiments on this very advanced car.

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Light Steam Car Suggestions.

By C. T. BOWER and F. R. BELL.

(Continued from last month.)

The lower plate has four radial grooves cut on the inside face, being steam passages allowing an even distribution of pressure on the under side of the pressure diaphragm. The diaphragm is several laminations of good quality shim steel, how many, we cannot exactly say at this time, but it will be stated later. Even then, the number and thickness of the laminations must be open to a certain amount of trial and error, but layers can be added and removed easily, and an idea of the strength can soon be reached.